Recurrent symptomatic aortic sac seroma after open abdominal aortic aneurysm repair

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The expansion of an abdominal aortic aneurysm sac after conventional repair has been rarely described. All cases in the literature have been associated with polytetrafluoroethylene grafts and perigraft seromas. We present a patient with a recurrent, symptomatic periaortic graft seroma after conventional repair. The etiology of this problem along with its potential increasing significance in the endovascular era is reviewed. (J Vasc Surg 2005;41:1058-60.)

CASE REPORT

Three years after undergoing an elective aortobiiliac bypass via a midline incision for a 9-cm abdominal aortic aneurysm, a 71-year-old man presented with a 1-week history of worsening mid abdominal pain, nausea, and abdominal fullness. An abdominal ultrasound examination demonstrated a large fluid collection around the patent graft.

The patient had a palpable pulsatile mass in the mid abdomen and a normal peripheral vascular exam. A spiral computed tomography (CT) scan of the abdomen and pelvis showed a large, perigraft fluid collection without evidence of active contrast extravasation or wall enhancement (Fig 1, *A*) Hounsfield units were intermediate between simple fluid and blood. No other intra-abdominal pathology was noted. An arteriogram showed no vascular communication with the fluid collection (Fig 1, *B*).

Over the next 24 hours, the patient had increasing abdominal pain. An exploratory laparotomy was performed, and the enlarged aneurysm sac was easily appreciated in the retroperitoneum (Fig 2, *A*). The sac contained a slightly viscous, cloudy fluid. There was no hematoma or bleeding within the aneurysm sac. The polytetrafluoroethylene (PTFE) graft (manufacturer unknown) was intact and had a viscous, gel-like substance on it (Figure 2, *B*).

Resection of the redundant sac and loose reapproximation of the edges was performed. The patient's abdominal pain resolved, and he was discharged home on postoperative day 6.

He did well until 2 months later, when he began to have vague abdominal discomfort and fullness. A spiral CT scan showed recurrent filling of the aneurysm sac (Fig 3). Upon re-exploration, the PTFE graft was surrounded by a gelatinous coating and thin serous fluid, without evidence of pseudoaneurysm or leak. Resection of the PTFE graft and replacement with a Dacron (DuPont) graft was performed. The remaining sac was closed around the graft.

Cultures were obtained from the fluid, gelatinous coating, and excised graft material; serologic and coagulation studies were obtained on the fluid sample. All Gram stains and cultures were negative. The chemical studies were consistent with a serous transudate, and coagulation studies showed no increased fibrinolytic activity. The patient's abdominal pain resolved, and he was discharged home on postoperative day 5. He has remained asymptomatic and without evidence of recurrent hygroma on CT for over 18 months.

DISCUSSION

Perigraft seromas have been reported in association with a variety of conventional vascular procedures.[1-8] A survey of vascular surgeons in 1985 revealed an estimated 279 cases.[5] Most were in superficially placed grafts, with axillofemoral and femorofemoral bypasses accounting for 58% of the total. Deep graft seromas occurred much less frequently, accounting for <10% of the cases in the survey. Shah et al[9] found no cases of perigraft seromas in over 1,000 cases with stretch PTFE aortoiliac grafts placed for aneurysmal and occlusive disease.[5] Re-expansion of an aortic aneurysm sac after conventional aortic aneurysm repair is rare, with only five such cases reported in the English literature.[1-4] All five were associated with perigraft seromas and PTFE grafts.

Four etiologies have been proposed for the development of perigraft seromas:

The first is due to a low-grade infection, with formation of a biofilm and reactive seroma. This is often seen with indolent infections years after graft placement.

The second is related to an immunologic reaction to the graft material.[8] There appeared to be an increased incidence of seromas in patients with knitted Dacron grafts and PTFE grafts, which accounted for approximately 88% of cases in the survey.[5] Resolution of the seroma has occurred with replacement of a Dacron graft with a PTFE graft and vice versa, which may indicate a patient-specific tolerance to certain grafts.[5,8]

The third theory is related to the extravasation of a serous ultrafiltrate through the graft. This is a flow-related phenomenon that has been has been demonstrated to occur with PTFE grafts both in vitro and clinically.[1-5,7,8]

Recently, Risberg et al[2] expanded upon this theory by proposing that the seroma develops as a result of increased activation of the fibrinolytic cascade with the development of a proteinaceous perigraft fluid collection which then increases the draw of fluid across the PTFE membrane. They found high levels of proteins associated with thrombus degradation within the sac and proposed that this was

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Competition of interest: none.

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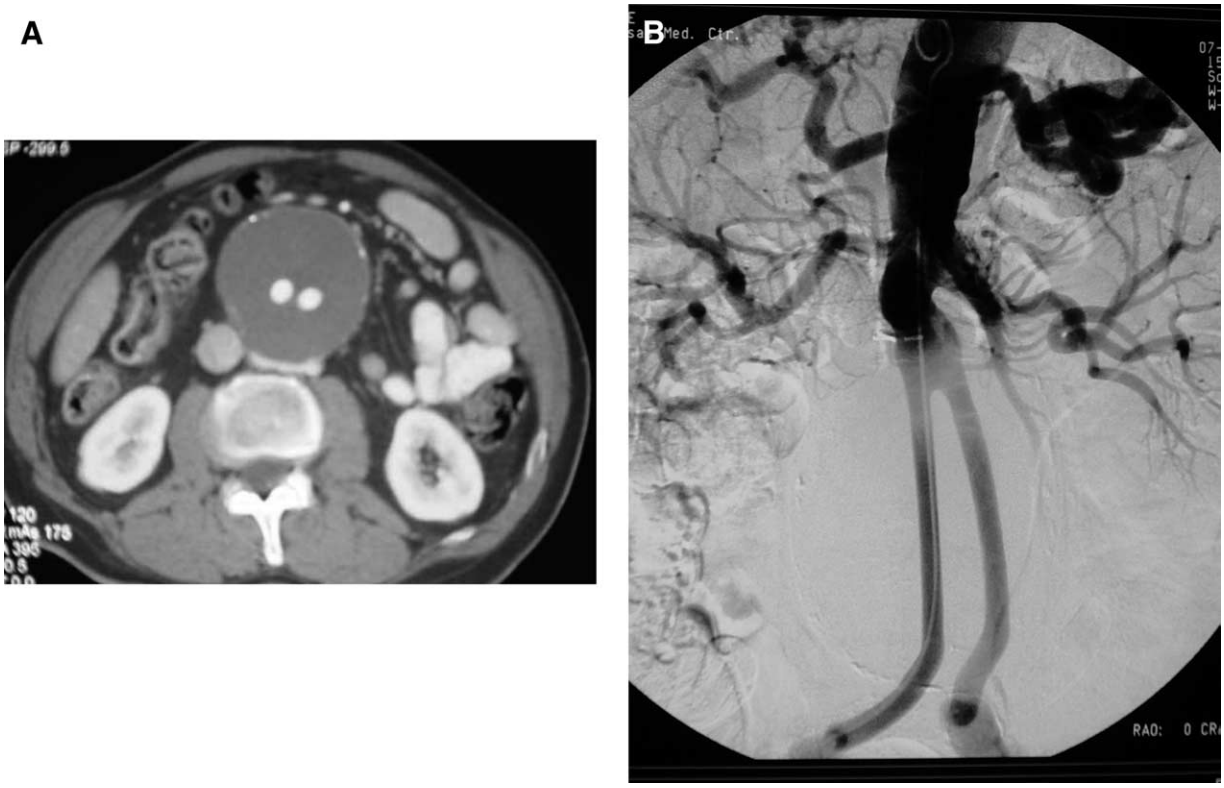

Fig 1. (A) Computed tomography scan demonstrates a perigraft seroma and distended aortic sac. **(B)** Digital subtraction angiogram shows an intact aortic graft without communication with the perigraft seroma.

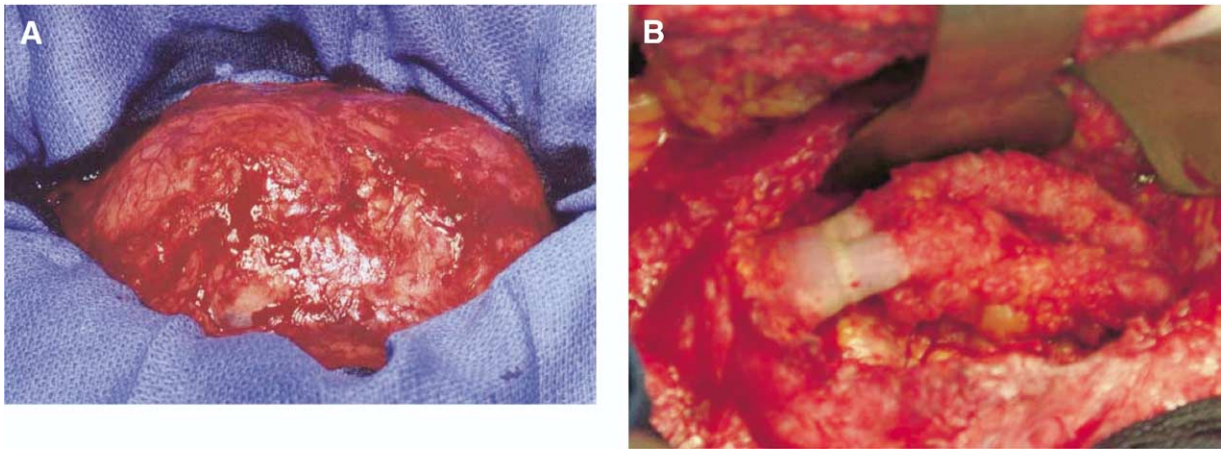

Fig 2. (A) Intraoperative photograph of the pressurized aortic sac. **(B)** Intraoperative photograph shows the intact polytetrafluoroethylene graft encased in a gelatinous covering within the aortic sac.

secondary to changes in the stress forces on the intrasac thrombus activating the fibrinolytic cascade.

Several studies have shown an increased incidence of delayed sac growth in PTFE endografts, and W.L. Gore & Associates recently released the results of the Excluder Abdominal Aortic Endoprosthesis Multicenter Pivotal trial, which evaluated the 4-year results of the Gore Excluder endoprosthesis.[10-13] This confirmed a trend of increasing sac size without endoleak over the 4-year experience. Nearly one third of all patients experienced sac enlargement by 48 months, and over half of these patients had no evidence of endoleak.

An evaluation of cases of explanted Excluder grafts revealed perigraft seromas and a gelatinous, fibrinous de-

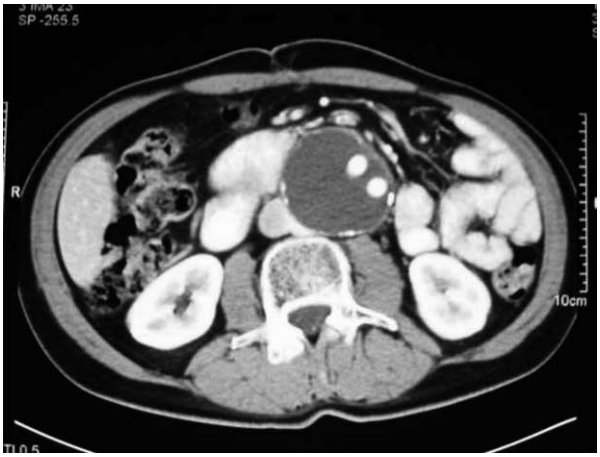

Fig 3. Computed tomography scan demonstrates recurrent aortic sac seroma.

posit on the graft similar to our findings. As no thrombus is removed from the sac during an endovascular repair, the Risberg group's theory may account for the increased incidence of seroma formation and sac expansion seen in endovascular PTFE repairs compared with conventional repairs.

A modified PTFE version of the Excluder graft has been released to address the problem of transudate formation across the graft material. Gore reports a decrease in transudate formation in a bench model with these modifications.

Treatment options for perigraft seromas include simple observation, incision and drainage, aspiration of the fluid, and replacement of the graft. The reported success rates in the survey by Blumenberg et al[5] were best with graft replacement (92%), and lowest with incision and drainage (53%).

Our patient underwent an open incision and drainage of his symptomatic perigraft seroma during the first operation and experienced resolution of his pain. Unfortunately, this provided only a few months of relief before seroma reaccumulated and his symptoms recurred.

In the symptomatic patient, a trial of percutaneous aspiration or open drainage may be warranted to provide relief and aid in diagnosis. If the fluid is infected or the patient has recurrence of the seroma, then the graft should be excised. Asymptomatic perigraft seromas or sac expansion without endoleaks should be followed closely for signs of graft migration or development of symptoms such as abdominal pain, nausea, fullness, or obstruction of the ureter or bowel.

Based on our report, the observations of other surgeons, and the acknowledgment of transudate formation by the manufacturer of a PTFE graft, we recommend continued vigilance in monitoring both open and endovascular PTFE grafts as well as further investigation into the significance and treatment of aortic perigraft seromas.

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